A TUFTING MACHINE

Background of the Invention

[0001] The present invention relates to tufting machines, and in particular, to tufting machines capable of producing a high-pile tufted product. Such machines may be used to produce artificial grass, and have been used to produce shag carpet.

[0002] During the tufting of a high-pile, cut pile material, the tuft legs of the yarn become extremely lively or springy immediately after being cut. This is particularly true in regard to polypropylene yarns. Accordingly, the free ends often may be pulled back through the backing material as they become trapped between neighboring needles and their associated yarn feed. Additionally, the cut yarn may enter the adjacent needle eye, and sometimes the adjacent needle may even sew through a previously formed loop in the case of loop pile. When any of these events occur, there is an obvious visual defect in the product.

[0003] According to the present invention, a tufting machine is provided which comprises a plurality of aligned needles arranged to reciprocate in a direction which, in use, is perpendicular to a backing material which is progressively fed through the machine; the machine having a hook associated with each needle oscillatably moveable, in use, to pick up yarn from its associated needle, a loop engaging surface of the hook being, in use, at least 50 mm below the backing material, and wherein each tuft is isolated from a tuft formed by an adjacent needle by a dividing plate which extends in the direction of needle reciprocation for at least 20% of the distance between the backing cloth and the loop engaging surface of the hooks.

[0004] By extending to this degree, the dividing plates prevent the free ends of yarn from coming into contact with neighboring needles.

[0005] Preferably, at least a major portion of each dividing plate is closer to its respective hook than to the backing material, as this is where the free ends of the yarn are formed.

[0006] Preferably, each dividing plate extends, i.e., has dimension in the direction of needle reciprocation, at least 30%, more preferably at least 50%, and possibly as much as 80% of the distance between the backing material and the loop engaging surface of the hooks.

[0007] Conventional tufting machines have a needle or reed plate which is essentially a series of fingers which support the backing material, between which fingers the needles penetrate during reciprocation. In one embodiment of the invention, the dividing plates may be extensions of the needle plate reed fingers. The tufting machine is provided with a support block on the bed plate on which the needle plate fingers, among other things, are mounted. The dividing plates may alternatively extend from the support block.

[0008] As a further alternative, the dividing plates may be mounted on a hook bar on which the hooks are mounted. However, in this case, the dividing plates would oscillate with the hooks.

Brief Description of the Drawings

[0009] The particular features and advantages of the invention as well as other objects will become apparent from the following description taken in connection with the accompanying drawings in which:

Fig. 1 is a schematic elevational view of a conventional tufting machine;

Fig. 2 is a similar view of a first embodiment of the present invention;

Fig. 3 is a similar view of a second embodiment of the present invention; and

Fig. 4 is a similar view of a third embodiment of the present invention.

Description of the Preferred Embodiment

[00010] The components of a tufting machine as shown in Fig. 1 are well known in the art. The tufting machine has a plurality of needles **1** arranged in at least one row perpendicular to the plane of Fig. 1 which reciprocate vertically. A backing material **2** passes through the machine, in this case, since the machine is a cut-pile tufting machine, from left to right perpendicular to the direction of needle reciprocation. A hook **3** associated with each needle is provided below the backing material on a hook bar **4** which reciprocates or more correctly oscillates the hook in a generally horizontal sense. A knife **5** in a cut-pile machine oscillates with respect to each hook to cut the loops of yarn formed on the hook. The present invention is also applicable to loop pile machines (i.e., where no knives are provided and the hooks **5** are replaced with loopers) which seize and shed the loops since the hook faces the opposite direction to that illustrated in Fig. 1. However, in this case, the movement of the ends of the loops is less of a problem as the loops are less lively when shed from the loopers than are the legs of cut pile.

[00011] A needle plate **6** having a plurality of spaced apart reeds or fingers **26** is mounted beneath the backing material **2**. This serves to support the backing material **2** at the point of needle penetration and takes the form wherein the plurality of fingers **26** is arranged perpendicular to the plane of Fig. 1 so that each needle **1** can penetrate between a pair of fingers. The needle plate **6** is supported on a support block **7** mounted on the bed plate **8** of the bed of the tufting machine.

[00012] The one unconventional feature of Fig. 1 is the separation between the backing material **2** and the hooks **3**. In this case, the separation is approximately 70 mm as this is the approximate required pile height of the tufted material. Such material is particularly applicable to artificial grass products. High pile machines are generally considered to be those having a pile

of 50 mm and above. Artificial grass machines also tend to be relatively course gauges (5/16" and above). These machines use polypropylene yarn and the free ends of this become extremely lively or springy when they are cut. These free ends readily become caught between an adjacent needle and its yarn feed and can be pulled back up through the backing material.

[00013] A first embodiment of the present invention is shown in Fig. 2 where a divider plate **10** is provided, the divider plate **10** here being an enlarged extension of the needle plate **6** in lieu of the needle plate fingers. Thus, the divider plate **10** is provided between each pair of needles. The divider plate extends down approximately 70% of the distance from the backing material towards the top of the hook. The plate **10** preferably is flared outwardly in the direction towards the hook and at its lowest surface, has a width of approximately six times the length of the back stitch. As will be appreciated from Fig. 2, the divider plate **10** prevents the free ends **11** of the cut tufts from moving sideways and coming into contact with adjacent needles.

[00014] The embodiment illustrated in Fig. 3 is similar to that in Fig. 2, except that this arrangement has a conventional needle plate **6** and needle plate fingers **26** and the divider plates **12** extend out of the support block **7** a distance that preferably is beyond that of the needle plate fingers **26** as illustrated. In this case, the height of a divider plate is approximately 20% of the distance from the backing material **2** to the top of the hook **3**.

[00015] In the embodiment illustrated in Fig. 4, there is again a conventional needle plate, but this time the divider plates **13** extend up from the hook bar **4**. In this case, the divider plate **13** is preferably flared upwardly towards the backing material **2**.

[00016] In use the divider plates provide a separator to prevent yarn loops in loop pile machines and the legs of the cut loops in cut pile machines from becoming trapped by an adjacent needle and associated yarn feed, and thereby precludes the free end of cut loop yarns

from being pulled back through the backing material and also from entering the eye of an adjacent needle.

[00017] Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to the preferred embodiment of the invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.